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BUREAU OF RECLAMATION PHOTO



MOVING WEST Water carrying perchlorate gets diverted westward from the lower Colorado River's Imperial Dam, just north of the Mexican border. After passing through the desiltation works on the left, the water enters the All-American Canal.

ENVIRONMENTAL POLLUTION

ROCKET-FUELED RIVER

Lower Colorado carries perchlorate to millions who drink its water, to those who eat lettuce irrigated with its water, and into a tribal well

BY CHERYL HOGUE, C&EN WASHINGTON

ALBERTO RAMIREZ STANDS ON A GREAT EARTHEN DIKE under the relentlessly blazing sun. The dike was built to ensure that when huge storms come, the really big ones anticipated to arrive every 100 years, the water that drains off the mountains won't wash away the development below.

To Ramirez' right is scrubby desert terrain, spotted with low-growing creosote bush, that extends across a plain and up nearby mountains.

To his left, under a brilliant blue sky, is the edge of a valley in the southeastern corner of California. Rectangular parcels of green developed land flourish as oases amid undeveloped tracts of desert. A golf course is under construction nearby, and workers wearing wide brimmed straw hats unroll strips of thirsty turf on the sandy soil. Closer to the dike, with strips of burlap at the ready, laborers at a nursery dig up the root balls of towering palm trees that will landscape nearby resorts in the Palm Springs area. And just up a gentle slope is a tract of the Torrez Martinez Desert Cahuilla Indian reservation with a church and neat collection of one-story houses that are

PERCHLORATE'S PATH

Las Vegas Wash

Kerr-McGee plant, near Las Vegas

Las Vegas

Lake Mead

Parker Dam

Fort Huachuca

Coachella Canal

Salton Sea

El Centro

San Diego

All American Canal

Morelos Dam (Mexico)

Colorado River

MEXICO

0 70 miles

Kerr-McGee Chemical Corp., which now owns the plant that made the perchlorate, is working with regulators to clean up the plume of contaminated shallow groundwater that is feeding hundreds of pounds of perchlorate into the lower Col-

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orado River each day. But some say that given current treatment rates, the cleanup will take decades.

PERCHLORATE SALTS are used to provide oxygen so solid rocket fuel can burn. They are used in rockets and Minuteman missiles. These salts are also found in roadside flares and airbag inflators and are used in the manufacture of matches. And perchlorates are highly soluble in water.

Perchlorate taints water in 22 states. The main sources of this contamination are users of perchlorate salts: Military bases, aerospace installations, and defense contractors that build rockets—such as the Massachusetts Military Reservation on Cape Cod or Lockheed Propulsion in Redlands, Calif., which manufactured rockets. A small amount of perchlorate pollution in the U.S. is believed to have stemmed from a sodium nitrate fertilizer made in Chile.

Nearly all of this contamination is confined to groundwater. The lower Colorado River is a notable exception.

The perchlorate contamination of the lower Colorado River is also unusual be-

cause of the sheer number of people exposed in their drinking water to a chemical that came from a single source of pollution. Roughly 15 million people are exposed to perchlorate through drinking water drawn directly—or in the case of the Torrez Martinez tribe, indirectly—from the lower Colorado River.

This river flows from Lake Mead, located east of Las Vegas, to form the Arizona-Nevada border and the state line between Arizona and California before crossing into Mexico. The trickle of water that is left after Arizona, California, Nevada, and Mexico each siphons off its share of the river empties into the Sea of Cortez.

Some people who get lower Colorado water through their household taps live hundreds of miles away from the river. Residents of Phoenix and Tucson to the east and San Diego to the west use water from the lower Colorado River. Although the lower Colorado does not account for the cities' entire municipal water supplies, which include wells and other rivers, it is an essential source of their water. Smaller communities near the Mexican border in southeastern California and southwestern

Arizona drink lower Colorado River water, too, and in some cases, the river is their sole source.

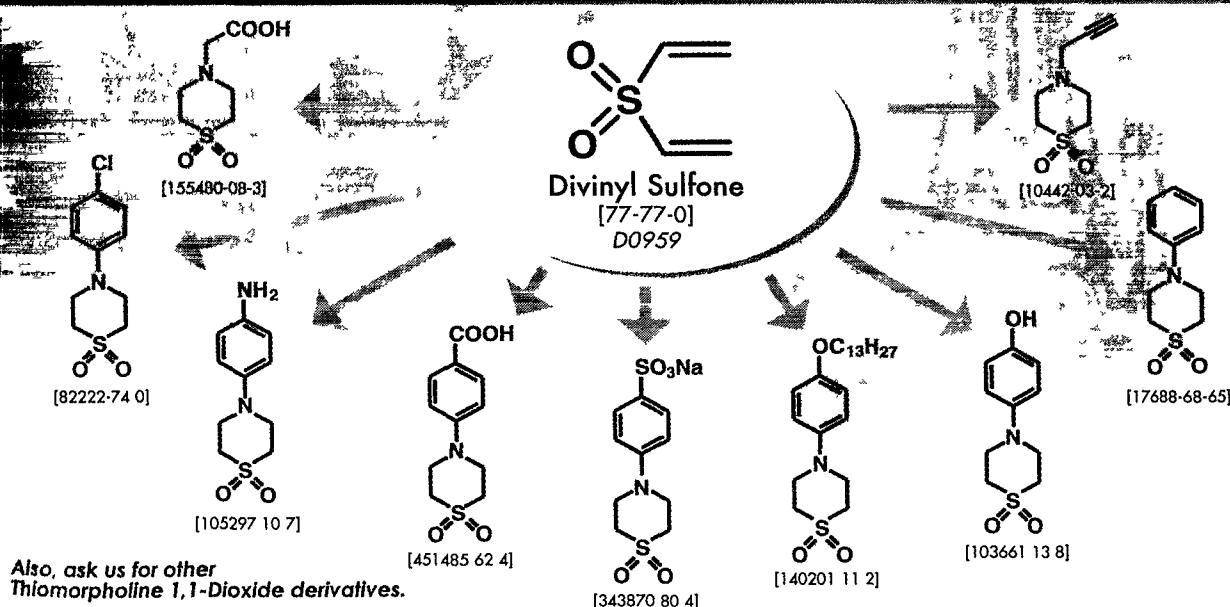
Exposure to perchlorate via the lower Colorado River is also unusual because it may extend across much of the U.S. Water from the river irrigates vast fields of vegetables that are shipped across the nation. Analyses released earlier this year showed that lettuce grown with perchlorate-tainted water contained the ion. Some of the land irrigated with the river's water is the main supplier of lettuce to America's dinner tables during the winter.

"It's hard to imagine more people exposed from any one release anywhere in the country," says Kevin Mayer, perchlorate coordinator for EPA's San Francisco-based Region 9, which encompasses the Southwest.

Meanwhile, federal agencies are embroiled in a debate over how much perchlorate can be in drinking water and still be considered safe.

No one knows how exposure to perchlorate in the concentrations found in some Nevada, Arizona, and California drinking water could be affecting human

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health. Like policy debates over so many other pollutants, the uncertain scientific evidence on the health effects of perchlorate in drinking water and vegetables boils down to the classic question: How much is safe?

IN 1999, EPA set 4 to 18 ppb as an "interim" range for perchlorate exposure while it completed a risk assessment on the chemical. That draft assessment, released in 2002, suggested a health-protective standard of 1 ppb. The Pentagon objected strongly to this number. It argues for a higher benchmark, with some of its contractors recommending a 200-ppb level, a standard that, if adopted, would dramatically cut cleanup costs.

To settle the dispute, the Bush Administration has asked the National Academy of Sciences to review the data on perchlorate and suggest a range for a drinking water standard. NAS is in the process of forming a panel that will examine the issue.

Meanwhile, perchlorate is expected to remain in the lower Colorado River for decades. Virtually all of this contamination originated at a chemical manufacturing facility located outside of Las Vegas. But this source was not easily identified.

The unraveling of this mystery began in 1997, when California regulators made an unsettling discovery. They knew that several aquifers in the Golden State, mainly near rocket-assembly plants and military bases, were polluted with perchlorate. But

the state recommended that utilities start analyzing their water for perchlorate.

Shortly thereafter, the Metropolitan Water District (MWD) of Southern California added perchlorate to the list of contaminants it regularly tests for. MWD is a consortium of 26 cities and water districts that provides drinking water to nearly 18 million people in Los Angeles, San Diego, and areas east of these cities.

"We didn't expect to find anything," says Edgar G. Dymally, a senior environmental specialist with MWD. But perchlorate showed up in samples taken at drinking water plants, he said. What was puzzling was that much of this water came from the Colorado River, not wells.

In the West, water is measured in acre-feet—the amount of water needed to cover an acre of land to a depth of 1 foot, or 325,851 gal. MWD draws more than 1 million acre-feet per year from the lower Colorado River. Through its testing, the water district discovered that the perchlorate at the drinking water plants came from the river.

MWD traced the perchlorate contamination up the river from its intake pipes in Lake Havasu, located about a third of the

contaminant was tracked to a tributary of Lake Mead called Las Vegas Wash, says Todd J. Croft, supervisor for remediation and leaking underground storage tanks at NDEP. Further sampling revealed that water heavily contaminated with perchlorate

emanated from a small spring, called a seep, that forms a stream flowing into the wash.

Feeding that seep is a shallow aquifer, Croft says. This groundwater flows slowly beneath the Kerr-McGee plant about 3 miles from Las Vegas Wash. That facility produced a variety of perchlorate salts for nearly 50 years.

The plant sits as sort of an island in Clark County, Nev., surrounded by the city of Henderson, about 10 miles southeast of Las Vegas. The facility is amid, but not technically in, Henderson, Croft explains.

THE KERR-MCGEE PLANT was part of an industrial complex originally operated as a magnesium production facility by the federal government during World War II. In the early 1950s, the U.S. Navy contracted with Western Electrochemical Co. to design, construct, and operate an ammonium perchlorate manufacturing facility at the industrial complex, says Patrick S. Corbett, director of environmental affairs, remediation, and planning at Kerr-McGee. Full-scale production of the perchlorate began in about 1951, he says. The chemical was used mainly for military and space exploration purposes.

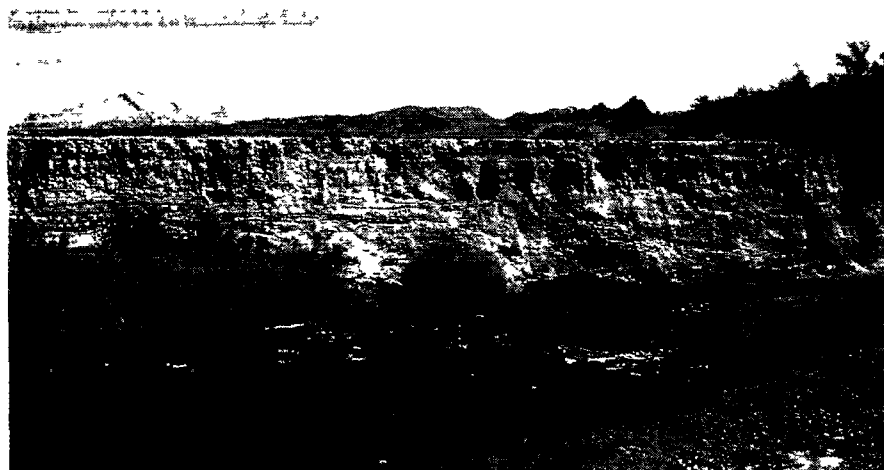
In 1962, the Navy sold the perchlorate operation to American Potash & Chemical Co., a firm which was acquired by Kerr-McGee in 1967, according to Corbett. Kerr-McGee produced perchlorate salts there until 1998.

A second perchlorate manufacturing plant, owned by Pacific Engineering & Production Co. of Nevada (PEPCON), began operating in Henderson in 1958. An explosion in May 1988 that killed two and injured 300 leveled the facility. It never reopened.

Both the Kerr-McGee plant and the PEPCON site have plumes of perchlorate-contaminated groundwater beneath them. The perchlorate likely percolated to the water table through earthen impoundments used for chemical waste disposal in the years predating modern pollution-control laws. But thus far, only the groundwa-

Batista estimates that it will take 24 years, give or take four years, to remove perchlorate from the groundwater at current removal rates.

PHOTO BY CHERYL HOGUE



CONTAMINANT CARRIER Las Vegas Wash has cut its channel deeper and wider as human activity has increased its flow.

with development of an ion chromatography technique that could detect perchlorate down to 4 ppb, the state found the chemical in drinking water outside of areas known to be contaminated. No one knew where it was coming from. An engineer for

way down the Arizona-California border, and into Lake Mead.

The Nevada Division of Environmental Protection (NDEP), part of the state's Department of Conservation & Natural Resources, then took over the hunt. The

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NO ONE KNOWS exactly when perchlorate began entering Las Vegas Wash, Lake Mead, and the lower Colorado River. The ion chromatography method that can detect perchlorate at levels as low as 4 ppb didn't exist until 1997. But in 2000, Batista and Roshan Boralessa, then a graduate student in environmental engineering, analyzed 1,500 frozen water samples taken from Las Vegas Wash and Lake Mead by the Clark County Sanitation District starting in 1993. The wash delivered about 440

Since regulators discovered perchlorate in the lower Colorado River, Kerr-McGee has spent \$80 million cleaning up the polluted aquifer below the plant and has another \$17 million in reserves to finish the job. It's also suing the Navy, trying to get

At the seep, the company constructed a miniature dam to create a pool, a tiny reservoir of contaminated water. Pumps carry this polluted water to a nearby treatment facility erected by Kerr-McGee

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PHOTO BY CHERYL HOGUE



LEGACY Batista surveys Las Vegas Wash. Sediments along its banks contain millions of pounds of perchlorate.

where ion-exchange technology strips out much of the perchlorate. The effluent runs into the small channel just below the little dam and into Las Vegas Wash.

BEFORE KERR-MCGEE installed the removal system, the groundwater fed between 900 and 1,000 lb of perchlorate per day into Las Vegas Wash, according to Croft. After the pump-and-treat system started operating in November 1999, this contribution was cut to 500 lb per day, he says.

Most of the perchlorate does not now enter the wash through the seep, Croft explains. Some of the polluted groundwater never enters the wash through a channel on the surface but moves into the waterway through gravels at its base.

In the past two years, Kerr-McGee has drilled nine wells upgradient of the seep, where tainted groundwater is intercepted, run through the perchlorate-removal system, and discharged downstream of the seep. However, Croft says the treatment of water emerging from the seep provides the most immediate benefits for water quality downstream.

Meanwhile, the wells are starting to prevent the polluted groundwater from reaching Las Vegas Wash through its gravelly base. By late 2004, the wells are expected to capture most of the groundwater moving toward the wash, cutting the contribution to an estimated 50 lb of perchlorate per day or less, Croft says.

Batista estimates that it will take 24 years, give or take four years, to remove perchlorate from the groundwater at current removal rates. "This is very long. There is no way they can do it faster with the current system," she says.

While Kerr-McGee's remediation ef-

forts are substantially reducing the amount of perchlorate entering the wash, they do nothing for the amounts of the ion trapped in sediments along the stream, Batista continues. An estimated 20 million lb of the ion still contaminates sediments along the banks of Las Vegas Wash.

At current cleanup rates and with the natural flushing of perchlorate down the river, Batista and her colleagues estimate that Lake Mead and the lower Colorado River will remain contaminated with the rocket-fuel component for the next half century. Another study to estimate this flushing rate, sponsored by California's MWD, is under way. Testing along the banks of the Las Vegas Wash showed that the sediments are filled with indigenous microorganisms that can break down perchlorate. Therefore, bioremediation of the sediments without excavating them may be possible, Batista says.

From the air, Las Vegas Wash is a narrow green ribbon slashing across the reddish browns of the Mojave Desert on the edge of the urban development that is greater Las Vegas. Located east of the casino-filled Vegas strip, this waterway might be called a stream or a creek or even a small river in less arid parts of the U.S.

For an estimated 2,500 years, Las Vegas Wash was ephemeral—water ran in the channel only occasionally, according to the

U.S. Geological Survey. In 1955, because of water use from development in the area, it started running continuously as a result of increasing flows of treated sewage. By 1960, this wastewater flow was slightly less than 10 million gal per day.

Today, some 161 million gal per day of water runs down Las Vegas Wash, according to the Southern Nevada Water Authority. About 83% is discharge from three municipal wastewater treatment facilities—one serving Las Vegas; another for Clark County; and the third for Henderson. Urban runoff and shallow groundwater each contributes about 7% to the flow of Las Vegas Wash. Wastewater from a nearby industrial complex contributes 3%. In the past 40 years, the wash has cut its channel wider and deeper because of the increasing flow.

The wash shows many signs of human intervention, notably flood-control structures such as a concrete overflow basin and big boulders placed along the banks to prevent erosion. The Southern Nevada Water Authority is planting rushes, cattails, and other wetland vegetation along the banks of the wash to improve water quality and to develop this green area into a park. In recent years, a section of the wash's channel was rerouted so that a new lake—Lake Las Vegas—could be built in a tony neighborhood. The concrete culvert carrying the wash's perchlorate-contaminated water runs under Lake Las Vegas.

After reemerging from the culvert, the wash wends its way through undeveloped desert to a bay of Lake Mead, dumping its load of sediment and perchlorate into the lake. When water levels at Lake Mead are low, as they have been in recent drought years, the delta formed by the wash is visible from shore.

At 157,900 acres, Lake Mead is huge—it is the largest construct-

ed lake in the U.S. Las Vegas Wash empties into Boulder Basin, the westernmost of the lake's five basins and the closest to Hoover Dam. Boulder Basin is also the location of the giant water intakes that suck Lake Mead water to the drinking water plants serving greater Las Vegas.

The high perchlorate levels of Las Vegas Wash water—averaging about 600 to

Like policy debates over so many other pollutants, the uncertain scientific evidence on the health effects of perchlorate in drinking water and vegetables boils down to the classic question: How much is safe?

800 ppb—are diluted after entering Lake Mead. However, the water of Las Vegas Wash doesn't mix quickly with the lake's water, Batista explains. The wash's water is warmer and has a greater concentration of dissolved solids—making it more saline—than Lake Mead. The differences in temperature and salinity slow down the mixing of the wash's perchlorate-tainted water into Lake Mead. Perchlorate levels at drinking water intakes, which are in the depths of the lake, are highest during the winter, Batista explains.

CROFT SAYS the greatest perchlorate concentration recorded at the intakes was 24 ppb in the winter of 2000 at the shallower of the two Southern Nevada Water Authority intakes. After treatment and blending with water drawn from the deeper intake, where perchlorate levels are generally lower, water mains carried less than 18 ppb perchlorate, which is Nevada's provisional level for the ion in drinking water, Croft notes.

Eight states have established a patchwork of advisory-only standards for perchlorate in drinking water, EPA's Mayer

says. Nevada has the most relaxed standard, and it is the state with the greatest number of people having the highest concentration of the ion in their drinking water, he adds. Maryland, Massachusetts, and New Mexico have the tightest benchmark—1 ppb. New York and Texas picked 5 ppb. The two states that in addition to Nevada withdraw water from the Lower Colorado also have standards—California

set a level of 4 ppb, and Arizona selected 14 ppb.

Past the water intakes in Lake Mead, the lower Colorado River moves through the Hoover Dam, then cuts through the desert, forming the Nevada-Arizona boundary and the state line between Arizona and California. Most cities and towns abutting the river, such as Lake Havasu City, Ariz., don't draw their drinking water

PUMP AND TREAT Croft says remediation efforts at the seep have cut the amount of perchlorate entering Las Vegas Wash from 900 lb per day to 500 lb per day.

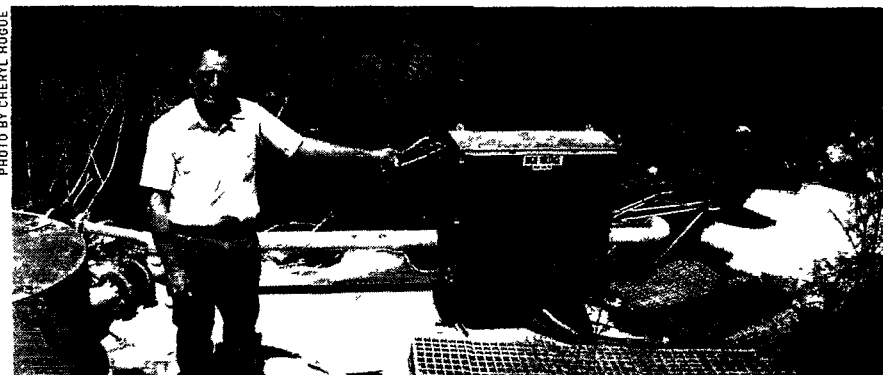


PHOTO BY CHERYL ROGUE

from the river. Instead, they tap into groundwater, which doesn't need the expensive filtration required to treat surface water, explains Mayer.

Parker Dam forms Lake Havasu, which helps control floods and serves as a reservoir and popular recreation area. Upstream of the dam, on the west bank of the river, three giant silver tubes emerge from a cliff and bend down into the lake. Water—and perchlorate—gets sucked through these “straws” into the Colorado River Aqueduct, a massive pipe-and-canal system that diverts water to cities along the Southern California coast. On the Arizona bank of the lake, just north of Parker Dam, is the

largest irrigation district is many miles west of the river, in California's Imperial Valley, south of the Salton Sea.

The Imperial Irrigation District (IID) holds the rights to the largest diversion of flow from the lower Colorado River, each year drawing more than 3 million of the 4.4 million acre-feet of river water allotted to California.

“We use more than the state of Arizona,” which has an allotment of 2.8 million acre-feet per year, says Tina A. Shields, IID's general superintendent for water resources planning and management.

IID's water is drawn upstream from Imperial Dam, which is located just north of where California, Arizona, and Mexico intersect. The water sluices westward in IID's All-American Canal, pulled by gravity across 82 miles of desert, including 14 miles of sand dunes. The lower Colorado River is the sole source of water for homes, industry,

and farms in a swath of California between the Salton Sea and Mexico.

Agriculture is the big business in the Imperial Valley, with annual revenues of more than \$1 billion from cattle, alfalfa, and vegetables, according to Steven A. Pastor, ex-

ecutive director of the Imperial County Farm Bureau and the Imperial Valley Vegetable Growers Association. The valley has

“We don't want to bear the responsibility for something we didn't create.”

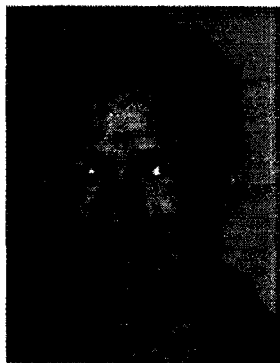
about 450,000 tillable acres. Although not all of it is planted at any given time, most of this land is irrigated with water supplied from the Colorado River by IID. The growing season generally extends from October until June. The top vegetable crop here is lettuce, harvested during the winter.

Farmers here weren't overly concerned about perchlorate in the lower Colorado River until recently.

IN APRIL, the Environmental Working Group and a newspaper in Riverside, Calif., the *Press-Enterprise*, independently released analyses showing that lettuce grown in Southern California, much of which is irrigated with perchlorate-contaminated water, contained the ion (C&EN, May 5, page 11). Some of the tainted irrigation water comes from the lower Colorado River, and some, used north of the Imperial Valley, comes from polluted aquifers.

Those findings have Imperial Valley farmers worried. They're not sure whether they should plant less lettuce for the 2004 harvest, Pastor says. They want EPA and the U.S. Department of Agriculture to use “sound science” to set allowable levels of perchlorate in both drinking water and food crops.

PHOTOS BY CHERYL ROGUE



Pastor



Shields

intake for the Central Arizona Project. This big channel carries the perchlorate-tainted water east and south to Phoenix and Tucson.

Patrick G. Gibbons, spokesman for the Arizona Department of Environmental Quality, says perchlorate has been detected in his state at 9 ppb or less. This is below the state's 14-ppb benchmark. “It's really not a problem,” he says of perchlorate. Arizona doesn't even check drinking water for this ion anymore, he says.

“We don't see it as a big problem, but it's certainly one we've assessed and one, in fact, that we didn't find enough evidence to continue sampling for,” Gibbons says.

Beyond the big intakes for urban areas and below Parker Dam, the lower Colorado ceases to be a lake and reverts to river. Traveling on a hot summer day along the highways paralleling this stretch of the waterway, black asphalt cuts through the sere landscape of seemingly unending desert scrub. Then, abruptly, lush green fields of alfalfa appear on both sides of the roadway. The road has crossed into an irrigation district. Here, canals divert the Colorado River onto the arid land, converting it to productive farm.

Many tracts near the Colorado's banks are irrigated with the river's water. But the



DESERT LIFELINE A worker for the Imperial Irrigation District checks the All-American Canal, which is the sole source of water for a large agricultural area south of California's Salton Sea.

"We're in limbo as far as what we're going to do," Pastor says. "The federal government is dragging its feet and making the farmers suffer down here."

But it's not just a regional concern, Pastor notes. "It's a nationwide issue," he says. The Imperial Valley and other parts of southeastern California and southwestern Arizona supply a majority of the winter lettuce sold in the U.S.

But perchlorate levels in lettuce—and possibly other vegetables—are not the only concern of growers irrigating their fields with lower Colorado River water. They also wonder if perchlorate gets into alfalfa they grow. Alfalfa is an even bigger crop than lettuce in the Imperial Valley. Some of that alfalfa gets fed to dairy cows—and growers wonder if any perchlorate ends up in milk, Pastor says.

If the perchlorate contamination makes lower Colorado River water unsuitable for irrigation, "that's going to put big problems on our economy down here," Pastor says. "We're talking millions of dollars here."

"We didn't cause the problem, but it's directly affecting us in a negative way," Pastor adds.

"We're just the guy at the end of the pipeline," IID's Shields agrees.

Unlike drinking water utilities, IID supplies raw water—water that has not undergone treatment, such as chlorination. The big issue for IID, like many suppliers in the arid West, is the quantity of water available, especially in the face of pressures such as a growing population, drought, and competition for water rights with other irrigation districts, cities, states, and Indian tribes.

More than 97% of the water IID draws from the lower Colorado River flows along thousands of miles of canals in grids around agricultural fields, Shields explains. The irrigation district also supplies raw water to seven towns and one private utility, which treat the water for municipal uses, including households.

IID began testing for perchlorate in 2001, Shields says. Levels of the ion in IID's main canals have remained about 4 to 5 ppb.

The irrigation district's main concern about perchlorate stems from a farming practice that uses water to flush excess salinity from the desert soil. This "outflow"



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WHAT RISK? Two independent analyses conducted earlier this year found perchlorate in lettuce irrigated with water containing the ion.

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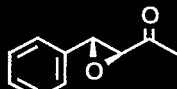
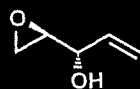
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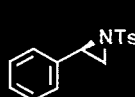
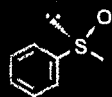
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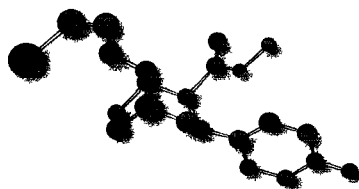
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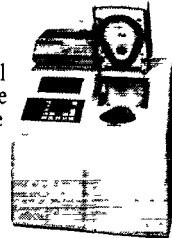
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water is released to IID canals that empty into the Salton Sea either directly or via the New or Alamo Rivers. Shields worries that because of this practice, regulators will deem IID a source of perchlorate pollution and will try to force IID to help pay for cleaning up the water.

"We don't want to bear the responsibility for something we didn't create," she tells C&EN.

Outflows of 1.36 million acre-feet of water from fields irrigated with Colorado River water drain to the inland sea each year, according to IID. EPA's Mayer says at least 400 ppb of perchlorate would be expected in the Salton Sea. But surprisingly, scientists have been unable to find the chemical in the sea, he says, adding that current analytical techniques allow detection levels only down to 100 ppb of perchlorate in the Salton's highly saline water. Mayer speculates that denitrifying bacteria in the sea break down perchlorate.

NORTH AND WEST of the Salton Sea, the lower Colorado River's perchlorate trail continues.

Veering off from IID's All-American Canal is a 122-mile-long branch canal that carries lower Colorado River water up the eastern side of the Salton Sea. This water goes to the Coachella Valley Water District, a utility serving an area that encompasses the northern end of the Salton Sea and stretches northwest to, but not including, Palm Springs.

The Coachella Valley Water District supplies both domestic water, which it

A tract of carefully tended grapes stands next to the new golf course near the Torrez Martinez reservation, below the earthen dam where Ramirez stands. The heat is intensifying as the sun climbs higher in the sky. He points to the undeveloped side of the dike. What looks like a giant stormwater retention pond, with steeply sloped sides, is below. There, he contends, is where the perchlorate got into the tribe's well.

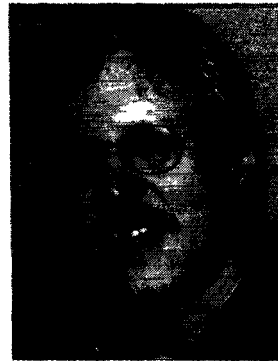
The Coachella Valley Water District ran a test project here to recharge groundwater. Much of the groundwater in this area is "ancient," having infiltrated the water table in centuries past. Snowmelt from nearby mountains and stormwater runoff provide some natural recharge, but it is outpaced by the demand for water in the fast-developing area. Water tables are dropping.

In years when the demand for irrigation water is less than its allotment of lower Colorado River water, the utility has used the excess to recharge groundwater, explains Alan C. Harrell, an engineering technician with the water district.

But lining the lower Coachella Valley are layers of clay with low permeability. There are only a few places in the utility's district where water can infiltrate the surface and percolate to the deep groundwater. The constructed basin Ramirez points to is one.

nation" in the Torrez Martinez tribe's well, he says.

The water district suspects that the perchlorate may have entered the aquifer after years of irrigation of fields near the well with lower Colorado River water. Harrell says the utility had to shut down one of its wells in part because of perchlorate con-



Harrell



Ramirez

tamination. That well was not in an area that would have benefited from recharge but was surrounded by land that has been irrigated with Colorado River water for decades, he says.

Ramirez dismisses the theory that irrigation could have polluted the tribal well, contending that agricultural runoff could not have reached to the water table because of the clay layers.

"We're not against the recharge. We understand the need for recharge," Ramirez says. But the utility needs to remove perchlorate from the Colorado River water before releasing it to the groundwater, he says.

That, says the utility, would be prohibitively expensive.

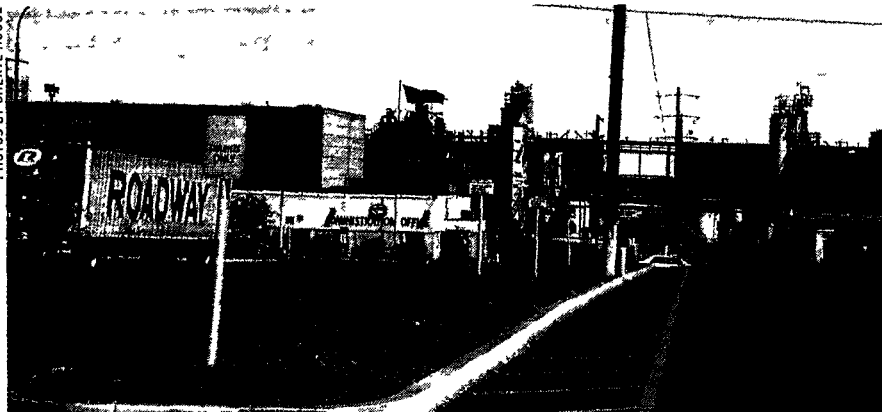
The concerns about recharge are moot for the time being. The Coachella Valley Water District has had its allotment of Colorado River water cut back and has not had enough extra water to do recharge.

The perchlorate contamination remains in the river and the tribe's well. Ramirez says the federal government needs to get involved in the cleanup of the lower Colorado River. "It's going to be the water that Californians are going to be drinking," he says. And Arizonans and Nevadans, too.

He also calls for a federal perchlorate standard—and he wants it as soon as possible. "It's taking EPA too long to make a decision." He says the delays are "not in the interest of the people. It's political."

Sweat trickles down the side of Ramirez' face. "We're facing a situation we didn't create." ■

PHOTOS BY CHERYL HOGUE



SOURCE Kerr-McGee's plant near Las Vegas, at the end of the street, manufactured perchlorate for nearly 50 years.

draws from more than 80 wells, and irrigation water from the lower Colorado River and conveyed through the canal. The dominant crops in the Coachella Valley are dates and table grapes.

Harrell says the water district placed only about 300,000 acre-feet of Colorado River water into the recharge pond over a five-year period. "We have no concern that recharge was the source of contami-